sem V / mech. / 27-11-12 / mechanical measurement & metrology.

71 : 2nd half-12-(i) JP

Con. 9476-12.

KR–5057

(3 Hours) [Total Marks : 100

N.B.: (1) Question No. **1** is **compulsory**.
(2) Solve any **four** from remaining.
(3) Assume **suitable** data if **required**.

1. (a) A dead zone of a certain pyrometer is 0·18% of the span. The calibration is 600 to 950°C. Find temperature change might occur before it is detected. **5**
   (b) A McLeod gauge has a bulb volume of 100 CC and capillary diameter of 1mm. Calculate pressure in Pascals correponding to 30 mm column of mercury in the capillary. **5**
   (c) A strain gauge is bounded to 0·1m long has a cross sectional area 4 cm^2, E = 210 GN/m^2. Unstrained Resistance = 240 Ω, gauge factor = 2·2. When load is applied the resistance of gauge changes by 0·013Ω. Calculate change in length and force applied. **5**
   (d) Explain interchangeability and its importance. **5**

2. (a) Explain with sketch methods of measuring the effective diameter of screw thread. **10**
   (b) Explain displacement measurement with potentiometer and L.V.D.T. **10**

3. (a) Define Gauge factor. Derive the equation for gauge factor. **10**
   (b) Explain the working and construction of profile projector and Toolmaker's microscope. **10**

4. (a) Differentiate between mechanical, optical, pneumatic comparator. **10**
   (b) The stress in M.S. flat circular diaphragm. **10**

$$\sigma = \frac{3D^2P}{16\,\epsilon^2}\ N/m^2 \text{ where}$$

$D = 0{\cdot}02\ m \pm 1\%$

$\epsilon = (0{\cdot}002\ m \pm 6 \times 10^{-6})\ m$

$$P = 40 \times 10^4\ \frac{N}{m^2} \pm 1\%$$

Calculate stress and maximum possible absolute error.

5. (a) Explain digital Tachometer and Stroboscopic method. **10**
   (b) Explain any one method of gear measurement. **10**

6. (a) Explain Thermocouple and thermisters. **10**
   (b) Explain use of slip gauges. Explain measurement of cone angle of taper plug gauge by sine bar. **10**

7. Write short notes (any **four**) :— **20**
   (a) Line and end standards
   (b) Static characteristics (five)
   (c) Calibration of pressure sensors
   (d) Accelerometers
   (e) Autocollimator.